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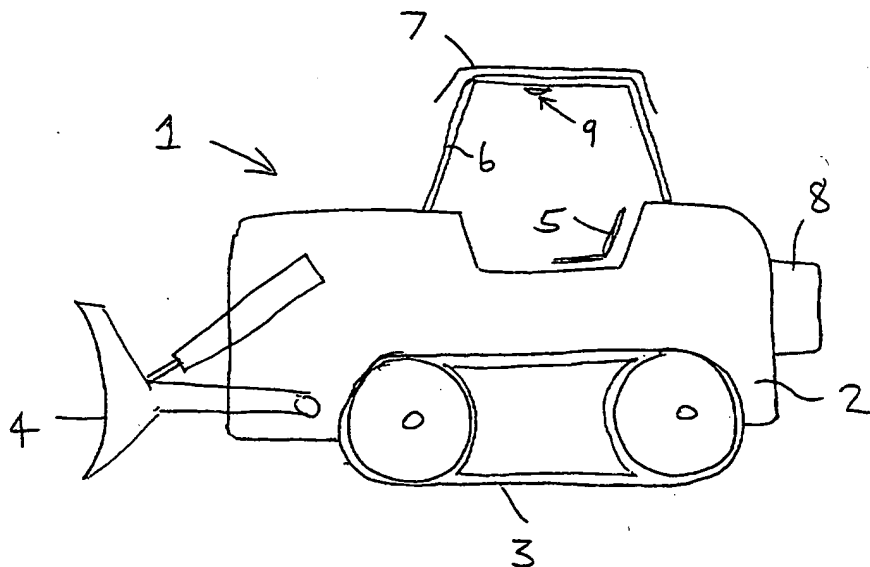
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GB 2307378 A GB 2286634 A WO 97/39924 A1  
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(54) Abstract Title  
**Automatic security system particularly for plant and machinery**

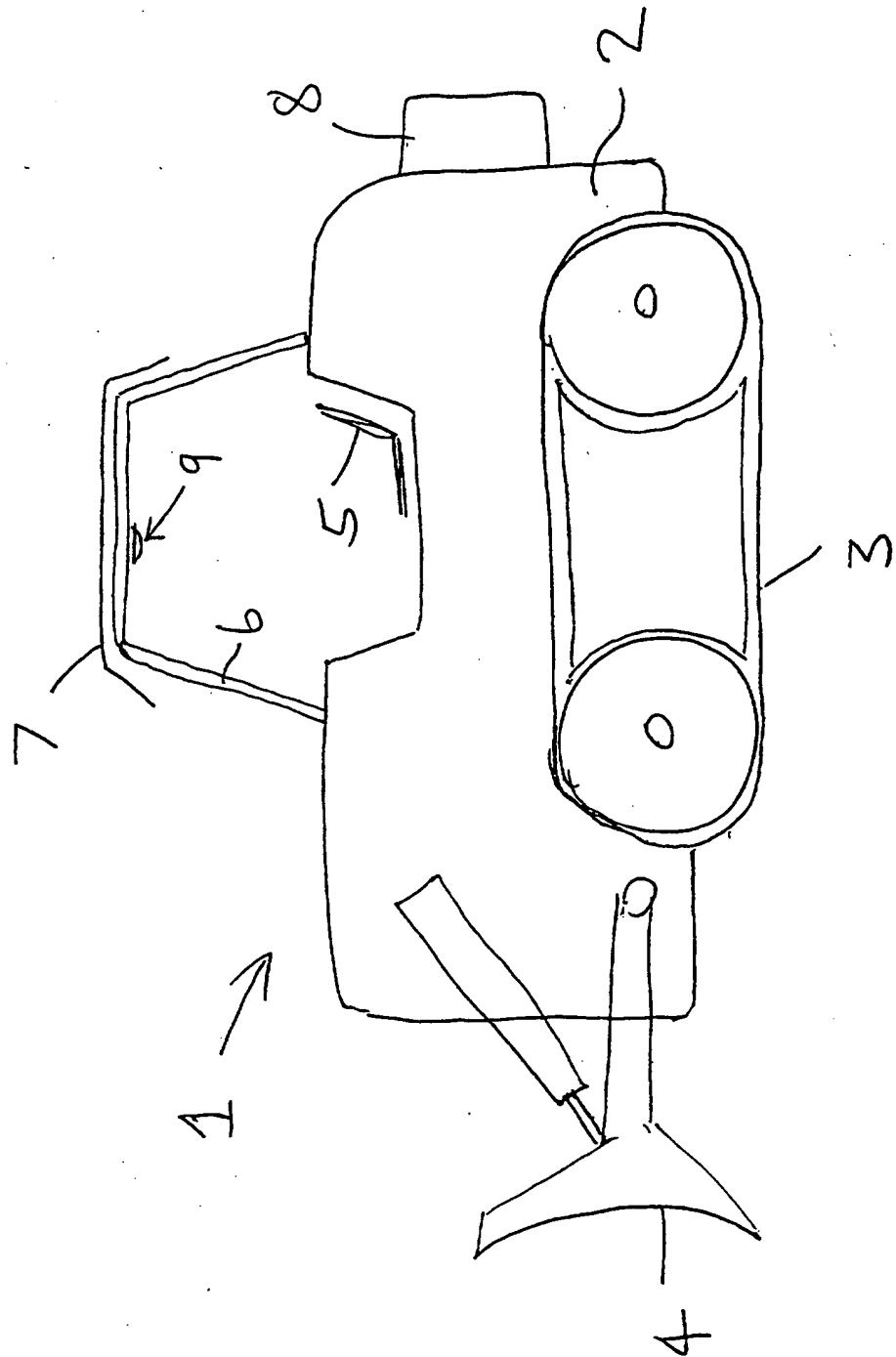
(57) A security card which incorporates an electronic key communicates with a control device on a vehicle, civil engineering plant or machinery such that the machinery is operable when the key is within a first predetermined distance, and partially or totally inoperable when the key is further than a second predetermined distance from the control device. The key may communicate an ID code using radio frequency signals. The key may be programmed to operate several different machines and a machine may be operable by several different keys. The key may be incorporated in a security badge to be worn by authorised operators and the key may act as an access key to particular buildings or site areas. The key may co-operate with recording machinery to record the movements of the key carrier and the time when a piece of machinery is used.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy. The claims were filed later than the filing date but within the period prescribed by Rule 25(1) of the Patents Rules 1995. This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

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**AUTOMATIC SECURITY SYSTEM,  
PARTICULARLY FOR PLANT AND MACHINERY**

This invention relates to an automatic control system, particularly suitable for automatic control of the operability of plant and machinery.

Many items of plant and machinery should only be operated by designated individuals or a designated class of individuals. For example, many machines used in the civil engineering industry require specialist training for safe operation and yet can be operated to an extent by untrained operators. It is, in the circumstances, highly desirable that operation of such machines be restricted to operators trained to operate the particular machine in question. The machine may be highly specialised (for example a pile drilling machine), and the authorised operator of such a machine may only be skilled in operating that particular machine. The machine may, however, be part of a general class (for example earth moving machines) which although specialist in nature are often used by operators skilled in more than one machine within the class. Thus it is desirable for one particular operator who is skilled, for example, in the use of both a bulldozer and a scraper to be able to use either machine on a civil engineering site whilst, at the same time, all other personnel on the civil engineering site are excluded from operating either machine.

The problems of providing adequate control over the use of machines is significant. Since most machines are fitted with a key operated engine control it is at first sight possible utilize the engine key for the purpose of controlling use of the machine. However, such procedures are cumbersome and are very liable to be ignored in use - engines of machines are commonly left idling whilst the operator is temporarily away from the machine and it is under such circumstances that unauthorised use of the machine is particularly dangerous.

Keyless door locking systems have been proposed for motor vehicles. One such system is disclosed, for example, in EP-A-0343619. However, such systems could only be used on plant or machinery having a lockable door, and this is very often not the case.

Accordingly, one aspect of the present invention provides an automatic control system, particularly suitable for plant and machinery, comprising: a control device having a first state in which the plant or machinery is operable and a second state in which the plant or machinery cannot be operated or can only be operated to a limited extent; and a key for controlling the state of the control device, the control device being responsive to the position of the key relative to a part of the control device whereby if the key is within a first pre-determined distance of the said part the control device is automatically placed in its first state and if the key is greater than a second pre-determined distance from the said part the control device is automatically placed in its second position.

With the preferred embodiment of the invention the key will be carried by an authorised user of the relevant plant or machinery. When that user is within the first predetermined distance from the relevant part of the control device the plant or machinery will be available for use. When the authorised user is greater than the second predetermined distance from the relevant part of the control device the plant or machinery will be disabled in whole or in part.

The preferred embodiments of the invention give rise to considerable subtlety in the design of particular control systems. For example, the control device may completely shut down the relevant plant or machinery, e.g. by stopping an internal combustion engine which provides motive power or by disconnecting the plant or machinery from a source of electrical power. In the alternative, however, the system may simply disable certain aspects of operation of the relevant machine. For example, in the case of a mobile crane the system may disable the crane controls but leave the movement controls of the mobile

crane operable. Thus, personnel other than the authorised operator may move the mobile crane, but no one other than the authorised operator can operate the crane controls.

Further, a particular key may be programmed to permit operation of several different pieces of plant or machinery or only a single piece of plant or machinery. Alternatively, or additionally the control device of a particular piece of plant or machinery may be programmed to respond to several different keys. Thus in the case referred to above an operator competent only in the use of a pile drilling rig may carry a key which controls only the operation of the pile drilling rig. An operator competent in use of several classes of earth moving machinery may carry a key effective to make any of the classes of machine for which the operator is trained available for his use.

Conveniently, the key will communicate with the control device by means of radio frequency signals. Preferably, the key is incorporated in a device providing additional security measures to ensure it is only used by the authorised operator. For example, the key may be incorporated within a security badge which bears a picture of the authorised operator. The key system may, if desired, perform auxiliary functions. For example, the key may act as an access key enabling those carrying it to have access to particular buildings or parts of a site. Also, the key may co-operate with suitable recording machinery to record the movement or position of the carrier of the key. For example, a particular piece of plant or machinery may include a recording device which records which operator used the machine at which time.

It will be appreciated that the operation of the control system in accordance with the preferred embodiment of the invention is entirely automatic. When the authorised user approaches a particular piece of plant or machinery the control device will change to its first state and make the plant and machinery available for immediate use by the operator. When the operator is greater than the second

predetermined distance from the relevant part of the control device the control device will automatically change to its second state and in whole or in part disable operation of the plant or machinery.

The invention will be better understood from the following description of a preferred embodiment thereof, given by way of example only, reference being had to the accompanying drawing wherein the single figure is a side view of a bulldozer incorporating an automatic control system according to the present invention.

The bulldozer 1 illustrated in the drawing comprises a conventional chassis 2 mounted on crawler tracks 3, and a dozer blade 4 mounted for movement relative to the chassis. A seat 5 is provided for the operator and a set of rollover bars 6 support a canopy 7 to protect the operator from rain and sun. However, as is conventional the bulldozer does not have a "cab" and accordingly there are no doors which may be locked in order to prevent access to the operator's position. As will be understood by those skilled in the art, the operator has available to him a range of controls for raising and lowering the dozer blade and controlling the crawler tracks to move and steer the bulldozer. Additional controls may be provided, for example, to control a winch 8 mounted on the rear of the chassis.

Bulldozers of the type illustrated in the drawing are often provided with large diesel engines which require relatively complex starting procedures, for example employing a donkey engine for starting the main engine. For this reason, it is highly undesirable for the engine to be switched off whenever the operator leaves his operating position. Equally, it is highly undesirable that the bulldozer is left available for use when the operator is not in the operating position since unauthorised operators may, under these circumstances, attempt to use the bulldozer or to move it. With plant of this type such unauthorised use is highly undesirable.

With a view to avoiding the problem of unauthorised use the bulldozer is

fitted with an automatic control system in accordance with the present invention. The control system incorporates a control device which, when in a second state, renders inoperative the controls of the bulldozer. The control device may be effective to render inoperative the controls by any suitable means - for example mechanically locking the controls or closing a master valve which isolates the controls from hydraulic fluid. The control device includes a sensor 9 which is mounted on the rollover bars 6 fitted above the drivers seat.

The driver is provided with a security card which incorporates an electronic key. The electronic key communicates with the sensor 9 and when the key is within a first pre-determined distance of the sensor the control device is automatically placed in its first state thereby rendering the bulldozer controls fully operative. The first pre-determined distance may, for example, be two metres. The arrangement is such that when the key is greater than a second pre-determined distance (for example four metres) from the sensor 9 the control device is automatically shifted into its second position and the bulldozer controls are disabled.

The preferred embodiment of the present invention may, in its simplest form, consist of a single key associated with a single control device thereby enabling a single operator only to access and operate a particular piece of machinery. It is envisaged, however, that more complex systems will in general be employed. For example, in a civil engineering contract different operators may be authorised to operate different machines and some operators may be authorised to operate several machines. By appropriately coding the keys and control devices such arrangements may automatically be implemented by use of the preferred embodiment of the invention. Further, the keys may be used to operate auxiliary security systems, for example to allow access to a site or to log which particular individual has been operating a particular machine at a particular time.

It will be appreciated that the invention is of wide general applicability and



may be used in many industries other than civil engineering. For example, within the context of a manufacturing industry the present invention may be used to prevent unauthorised operation of machine tools by other than trained operators and unauthorised changing of machine settings other than by suitably authorised personnel. Any particular machine may have several levels of control - for example operation of the machine may be restricted to certain trained operators whilst access to the machine controls may be restricted to other trained staff. Again, signals from the keys may be used to log the operation of a particular machine.

In a particularly preferred embodiment of the invention the key comprises a badge worn by or attached to an operator. The badge may, for example, be an identity badge incorporating a photograph of the operator. The key may be powered by primary cells or one or more rechargeable cells if a battery charging system is provided.

Preferably, each key has a unique ID code which can conveniently be programmed in at the time of manufacture. The badge preferably transmits its ID code at suitable predetermined intervals, for example intervals of between 10 and 20 seconds. The ID signal may be transmitted using VHF or UHF frequencies via an internal antenna. Preferably, each transmission comprises several continuous repetitions of the ID code so as to enable the sensing means on the plant or machinery to detect at least one full ID code. The ID code may be transmitted at regular intervals or random or pseudo-random intervals. In the event that the authority represented by a particular key is withdrawn (for example because the key is lost or the operator in question is no longer authorised to use the relevant machine), the control device on the machine can readily be re-programmed so as not to be responsive to the ID signal of the key in question.

## CLAIMS

1. An automatic control system, particularly suitable for plant and machinery, comprising: a control device having a first state in which the plant or machinery is operable and a second state in which the plant or machinery cannot be operated or can only be operated to a limited extent; and a key for controlling the state of the control device, the control device being responsive to the position of the key relative to a part of the control device whereby if the key is within a first pre-determined distance of the said part the control device is automatically placed in its first state and if the key is greater than a second pre-determined distance from the said part the control device is automatically placed in its second state.
2. An automatic control system according to claim 1 wherein the control device, when in the first state, completely shuts down the relevant plant or machinery.
3. An automatic control system according to claim 1 or claim 2 wherein the control device, when in the first state, stops an internal combustion engine which provides motive power to the plant or machinery or disconnects the plant or machinery from a source of electrical power.
4. An automatic control system according to claim 1 wherein the control device, when in the first state, disables certain aspects of operation of the relevant machine.
5. An automatic control system according to any preceding claim wherein the key may be programmed to permit operation of several different pieces of plant or machinery.
6. An automatic control system according to any of claims 1 to 4 wherein the

key may be programmed to permit operation of or only a single piece of plant or machinery.

7. An automatic control system according to claim 1 wherein the control device may be programmed to respond to several different keys.

8. An automatic control system according to any preceding claim wherein the key communicates with the control device by means of radio frequency signals.

9. An automatic control system according to any preceding claim wherein the key is incorporated in a device providing additional security measures to ensure it is only used by the authorised operator.

10. An automatic control system according to claim 9 wherein the key is incorporated within a security badge which bears a picture of the authorised operator.

11. An automatic control system according to any preceding claim wherein the key system performs auxiliary functions.

12. An automatic control system according to claim 11 wherein the key acts as an access key enabling those carrying it to have access to particular buildings or parts of a site.

13. An automatic control system according to claim 11 or claim 12 wherein the key co-operates with suitable recording machinery to record the movement or position of the carrier of the key.

14. An automatic control system according to claim 13 wherein a particular

piece of plant or machinery includes a recording device which records which operator used the machine at which time.

15. An automatic control system substantially as hereinbefore described with reference to the accompanying drawing.



Application No: GB 9913433.0  
 Claims searched: All

Examiner: Gareth Griffiths  
 Date of search: 8 December 2000

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
 UK Cl (Ed.R): F1B (B2Z), F2J (J2D), H4L (LASS, LCAC, LDA, LDLX, LETD, LETXX, LERX)  
 Int Cl (Ed.7): B60R 25/00, 25/04, E05B 49/00, G07C 9/00  
 Other: Online Databases: WPI, EPODOC, JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB2307378 A (SIEMENS) p.3 lines 9-24	1-4, 6 at least
X	GB2286634 A (TOAD INNOVATIONS) whole document	1-4,6,8,11 at least
X	WO97/39924 A1 (MURRAY) p.4 lines 7-35	1-4,6-8,11,13 at least
X	US5459448 (DORTENZIO) see abstract	1-4,6,8 at least
X	US4023138 (BALLIN) whole document	1-4,6,8 at least
X	JP060299799 A (KAJIMA) see PAJ abstract	1, 4-13 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.